

RETAX

Property tax and energy efficiency in the residential sector

Interviews with EPB certifiers

Victoria Taranu & Griet Verbeeck

KU LEUVEN



Voor meer informatie over deze publicatie victoria.taranu@uhasselt.be

© 2020 RETAX

RETAX is een Strategisch Basis Onderzoek (SBO, S005718N) gefinancierd door het Fonds voor Wetenschappelijk Onderzoek (FWO).

Niets uit deze uitgave mag worden verveelvuldigd en/of openbaar gemaakt door middel van druk, fotokopie, microfilm of op welke andere wijze ook, zonder voorafgaande schriftelijke toestemming van de uitgever.

No part of this book may be reproduced in any form, by mimeograph, film or any other means, without permission in writing from the publisher.

Deze publicatie is ook beschikbaar via www.retax.be

INDEX

Abstract	4
Introduction	5
1. Methodology	7
1.1 Research design	7
1.2 Data collection	7
1.3 Data analysis	8
2. Main findings	10
2.1 Profile EPB certifiers	12
2.1.1 Profile of the EPB certifiers/ Type of clients/ Number of certifications/ Regions	12
2.2 Implementation EPB/ Decision making	12
2.2.1 Stage design	12
2.2.2 Calculation method/ Software	13
2.3 Familiarity with the property tax reduction	14
2.3.1 Familiarity of the EPB certifiers, architects and clients with the property tax reduction	14
2.4 Lower E-level	15
2.4.1 Lower E-level and the property tax reduction	15
2.4.2 Lower E-level and profile of the clients/ Motivations	16
2.4.3 Lower E-level and other policies	17
2.5 Energy-efficiency measures	17
2.5.1 PV panels	20
2.5.2 Ventilation system	22
2.5.3 Heat pumps	23
2.5.4 Airtightness test	24
2.5.1 Solar water heaters/ Insulation / Windows	24
2.6 nZEB 25	
2.6.1 nZEB profile clients/ motivations/ nZEB other policies	25
3. Conclusions and policy recommendations	25
Attachment 1	28

ABSTRACT

In Flanders, a property tax reduction is offered for new constructions if higher energy performance standards are achieved than the minimum requirements. Preliminary quantitative analysis of the data regarding new constructions in Flanders provides evidence of a bunching effect at the E-levels required by the property tax incentive. The study aims to investigate whether the property tax played an important role in encouraging additional investments in energy efficiency. Another aim is to understand the mechanisms of decision-making between the client, the architect and the EPB certifier. For this purpose in-depth, semi-structured interviews with EPB certifiers operating in Flanders were undertaken. Findings show that the property tax incentive plays an important role in decision making, principally when the levels required by the property tax are close to the minimum standards as in recent years. The most commonly used methods to achieve lower E-levels are PV systems, followed by efficient ventilation systems, heat pumps and airtightness test to a lesser extent. Investments in systems are motivated by a common practice of making the EPB certification after the building permit was released; therefore, changes in the design are problematic. At the same time, additional investments in higher insulation levels beyond the minimum standards required by S-levels do not contribute significantly to lowering the E-level. Only EPB certifiers that are also the project architects have a more holistic approach and make EPB simulations at an earlier design stage.



**Research Foundation
Flanders**
Opening new horizons

INTRODUCTION

Decarbonisation of the building stock plays an important role in the context of the EU long-term goal of reducing CO₂ emissions in 80-95% by 2050 compared to 1990 (EC 2018). Following the Energy Performance of the Buildings Directive (EC 2002) and its recasts (EC 2010) (EC 2018), the EU member states adopted energy performance of buildings standards (EPB standards) for new constructions and major renovations. These minimum energy performance requirements were progressively getting stricter, achieving by 2021 nZEB (nearly zero energy building) standard.

In Flanders, the EPB standards were implemented starting from 2006, see Table 1. The nZEB definition was introduced and promoted starting from 2014, being set at the E-level of E30. This level will become the minimum requirement for new constructions in 2021. According to the calculation system implemented by the Flemish Energy Agency, the E-level depends on the following parameters: thermal insulation, airtightness, compactness, orientation, insulation, ventilation losses and systems (for heating, hot water, ventilation, cooling and lighting) (VEA 2020).

At the same time, building regulations were accompanied by various financial incentives, one of them being the property tax reduction introduced in Flanders in 2009. Even though starting from 2016 it is also offered for renovations; the current study regards only new constructions. In the first three years, a 20% and 40% reduction in the property tax was offered for achieving lower E-levels than the ones required by the EPB standards. In the following years and until now, the property tax reductions increased to 50% and 100%. The E-levels required for the property tax incentive changed over the years, following the evolution of the EPB standards, see Table 1.

The present study aims to verify whether the property tax incentive played a role in the decisions of private homeowners to invest more in energy performance than the level required by the EPB regulations. For this purpose, we have undertaken semi-structured interviews with EPB certifiers operating in Flanders. The study regards only residential new constructions, specifically single-family dwellings. The purpose of the semi-structured interviews was to understand in depth the process of the EPB certification, the decision making process regarding energy performance and whether the property tax incentive is one of the factors influencing it.

The aim of the study was justified by the preliminary quantitative analysis of the data regarding new constructions in Flanders that provides evidence of a bunching effect, see Figure 1. In the cases where the E-level was close to the one required for the property tax reduction, homeowners could have decided to make an additional investment to achieve it. Alternatively, the bunching can be caused by an 'anticipation effect' of the legal required E-level of the following years since the Flemish Energy Agency announced a calendar for the following years. For example, the minimum requirement of E40 in 2018 coincides with the level required for a 50% property tax reduction in 2015 (see Table 1). Other incentives could have been the income tax subsidy or the cash incentives provided by the grid operators that have been available for some years coinciding with the property tax subsidy. The interviews also aimed to clarify whether these policies played a role in the bunching effect.

Table 1 The evolution of the minimum required E-levels of the EPB regulations, property tax reductions and nZEB over the years in Flanders

	EPB requirements	Property tax reduction requirements		nZEB definition
	E-level	50%	100%	
2006	E100	-	-	-
2007	E100	-	-	-
2008	E100	-	-	-
2009	E100	E60 20%	E40 40%	-
2010	E80	E60 20%	E40 40%	-
2011	E80	E60 20%	E40 40%	-
2012	E70	E60 20%	E40 40%	-
2013	E70	E50	E30	-
2014	E60	E40	E30	E30
2015	E60	E40	E30	E30
2016	E 50	E30	E20	E30
2017	E50	E30	E20	E30
2018	E40	E30	E20	E30
2019	E40	E30	E20	E30
2020	E35	E30	E20	E30
2021	E30	E30	E20	E30

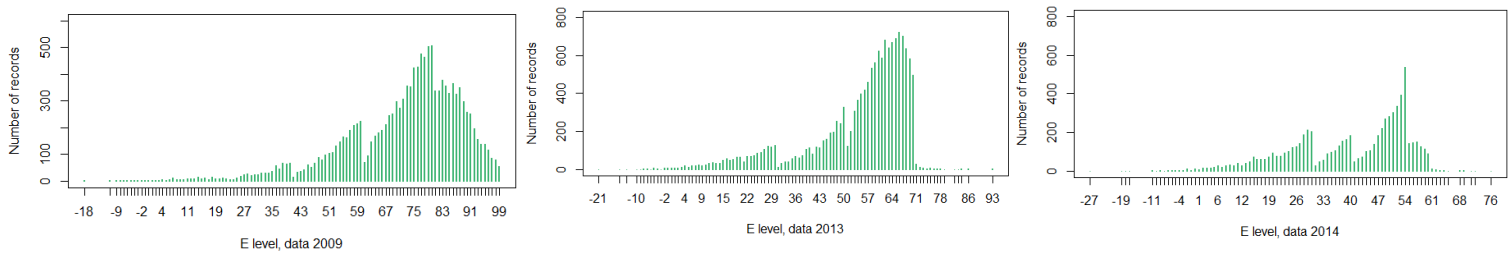


Figure 1 Bunching effect for E-levels required for the property tax incentive – E40 and E60 in 2009, E50 and E30 in 2013 and E30 and E40 in 2014. Data from building permits of single-family dwellings in Flanders.

1. METHODOLOGY

1.1 Research design

The current study presents findings of semi-structured interviews with EPB certifiers operating in Flanders. Given the evidence of a bunching effect in the data regarding new constructions in Flanders at the values coinciding with the E-levels required for the property tax incentive, see Figure 1, the aim of the study was to investigate the role of the property tax incentive in decisions to invest in energy efficiency.

The main research question of the study was the following:

- What is the role of the property tax subsidy in influencing decisions regarding achieving higher standards of energy performance for the new constructions in Flanders compared to the levels required by the building regulations or other policies?

For a better understanding of the context, secondary research questions were:

- Knowledge. Are clients, architects and EPB certifiers familiar with the property tax incentive offered?
- Impact of the property tax incentive on improving the energy efficiency of the newly-constructed dwelling compared to other policies (minimum requirements, income tax incentives and cash incentives from network operators).
- If the property tax subsidy has an impact, which measures are chosen to improve the energy performance?

In order to assess the impact of the property tax incentive on decisions to invest more in energy efficiency, other aspects of decisions making have to be taken into account, such as:

- At which stage of the design are EPB certifiers contacted?
- Who takes decisions regarding the energy efficiency measures, the client, the architect or the EPB certifier?

Lastly, the end of the interview aims to define the profile of the EPB certifier, in terms of the number of certifications per year, the regions of Belgium where he or she has license to operate, and whether they are also architects.

1.2 Data collection

The interviews with EPB certifiers took place face-to-face during January 2020. Invitations for the interviews were sent by e-mail to the list of approximately 1700 EPB certifiers operating in Flanders published by the Flemish Energy Agency in November 2019. Seven certifiers have volunteered for the interview. Participants represent a wide range in terms of location, size of the city and size of the company. A limitation of the study is that all the EPB certifiers that volunteered are males. Another limitation could be the self-selection bias, in order to overcome it, the EPB certifiers were not notified in advance that the main topic of the research is the impact of the property tax. The interviewees were only told that the investigation concerns decision making of homeowners and the EPB certification scheme. The purpose was twofold, to investigate if the EPB certifiers are familiar with the property tax incentive and secondly, to verify if they mention it spontaneously before the

questions relative to the incentive, as one of the factors influencing decisions regarding energy efficiency. The interviewer used as a guideline the list of questions presented in Attachment 1.

1.3 Data analysis

The interviews were registered on audio and their verbatim transcription was analysed with the use of NVIVO software. The methodology of analysis was thematic coding. Thematic codes emerged out of the primary and secondary research questions presented in the previous section. Most of the thematic labels were defined prior analysing the interviews with NVIVO, while few of them emerged during, such as some of the energy efficiency measures.

Table 2 Overview of the main and secondary thematic codes and research questions

Research questions	Main thematic codes	Secondary thematic codes
Knowledge. Are clients familiar with the PT incentive offered?	Familiarity with property tax incentive	Familiarity architects
		Familiarity EPB certifier
		Familiarity clients
Impact of the property tax incentive on improving the energy efficiency of the newly-constructed dwelling compared to other policies.	Lower E-level	Lower E-level and property tax incentive
		Lower E-level profile clients
		Lower E-level motivations
		Lower E-level and other policies
If it has an impact, which measures are chosen to improve the energy performance?	EE measures	Airtightness test
		Heat pumps
		Insulation
		PV panels
		Solar water heaters
		Ventilation
		Windows
	nZEB	nZEB profile clients

Whether property tax incentive or other policies effective to encourage nZEB		nZEB motivation
		nZEB other policies
Decision making/ other aspects of EPB implementation	Implementation EPB	Calculation method/ Software
		Stage design
Defining the profile of the EPB certifier	Profile EPB certifier	Type of clients
		Number of certifications
		Regions

provides an overview of thematic labels and their relation to the research questions. Most of the thematic labels were defined prior analysing the interviews with NVIVO, while few of them emerged during, such as some of the energy efficiency measures.

Table 2 Overview of the main and secondary thematic codes and research questions

Research questions	Main thematic codes	Secondary thematic codes
Knowledge. Are clients familiar with the PT incentive offered?	Familiarity with property tax incentive	Familiarity architects
		Familiarity EPB certifier
		Familiarity clients
Impact of the property tax incentive on improving the energy efficiency of the newly-constructed dwelling compared to other policies.	Lower E-level	Lower E-level and property tax incentive
		Lower E-level profile clients
		Lower E-level motivations
		Lower E-level and other policies
If it has an impact, which measures are chosen to improve the energy performance?	EE measures	Airtightness test
		Heat pumps
		Insulation
		PV panels
		Solar water heaters
		Ventilation
		Windows

Whether property tax incentive or other policies effective to encourage nZEB	nZEB	nZEB profile clients
		nZEB motivation
		nZEB other policies
Decision making/ other aspects of EPB implementation	Implementation EPB	Calculation method/ Software
		Stage design
Defining the profile of the EPB certifier	Profile EPB certifier	Type of clients
		Number of certifications
		Regions

2. MAIN FINDINGS

The first subsection presents the two profiles of EPB certifiers that were interviewed. Six out of seven interviewees are specialised mainly on EPB certifications and make the calculations for projects of other architects. Only one of the certifiers is a practicing architect who is part of an architectural firm that do certifications only for their own projects. The following subsections will detail more on the differences between these two types of EPB certifiers and how these differences are relevant to the design and decision making process regarding energy efficiency. The external EPB certifiers are contacted by architects or homeowners only at a late stage of design, when the building permit has been issued. The architects who make their own certifications are able to make EPB calculations at different stages of the design, starting with an early phase.

The following findings regard the property tax incentive such as the familiarity of clients, architects and EPB certifiers with the subsidy and its impact on decision to invest more in energy efficiency. To conclude, details of the most often recommended measure are presented. There is consensus that the most frequently used method is increasing the capacity of the PV system, followed by efficient ventilation systems, heat pumps and airtightness test to a lesser extent, see Table 3. Insulation is mentioned often, yet in the context that it does not contribute to a lower E-level significantly. These findings are in line with the quantitative analysis on new constructions in Flanders, the correlation between E-level and systems appear in the following order: PV systems, airtightness test, U-value, heat pumps and ventilation system, see Attachment 2.

Table 3 Frequency of the thematic labels. Results of analysis with NVIVO software.

Main thematic codes	Secondary thematic codes	Files (number of certifiers)	References (number of citations)
Profile EPB certifier	Profile EPB certifier	7	7
	Type of clients	7	8
	Number of certifications	7	7
	Regions	7	7
Implementation EPB/ decision making	Implementation EPB	2	4
	Stage design	7	16
	Calculation method/ Software	5	9
Familiarity with property tax incentive	Familiarity architects	3	6
	Familiarity EPB certifier	3	3
	Familiarity clients	5	8
Lower E-level	Lower E-level	4	11
	Lower E-level and property tax incentive	7	22
	Lower E-level profile clients	5	7
	Lower E-level motivations	4	7
	Lower E-level and other policies	3	5
EE measures	EE measures	4	6
	PV panels	7	18
	Ventilation	5	9
	Heat pumps	5	8
	Insulation	4	7
	Airtightness test	3	6
	Solar water heaters	2	2
	Windows	2	2
nZEB	nZEB	1	1

	nZEB profile clients	7	11
	nZEB motivation	5	6
	nZEB other policies	5	6

2.1 Profile EPB certifiers

2.1.1 Profile of the EPB certifiers/ Type of clients/ Number of certifications/ Regions

All the interviewed EPB certifiers have a long experience in the field of at least 8-10 years, one of them being active since the beginning of the introduction of the regulations in 2006. Geographically the EPB certifying companies interviewed are located in the East and West of the Flemish Region, both in smaller and bigger cities.

6 out of 7 EPB certifiers interviewed are contacted by architects for certifications and they are not involved in the initial design the projects. The exception is one of the interviewed certifiers, who is also an architect and his firm certifies only of their own projects. Besides, most of the certifiers agreed that the share of architects who are also certifiers has decreased over the years. These two types of EPB certifiers are involved at different stages of the design. The first type of certifiers is contacted at a late stage of the design by the architects or the clients, in most of the cases after the building permit was issued.

These two types of EPB certifiers also differ in the number of certifications per year. The companies that make only EPB calculations usually make certifications for apartments buildings or social housing, therefore the number of certifications per year can add up to hundreds. The architectural firm that makes the calculations only for their own projects made around 120 projects over the last 10 years. Most of the certifiers have the license only for the Flemish Region and only one of them operates also in the Walloon Region and the Brussels Capital Region. Different regulations and the obligation to undertake different trainings were among the main barriers for working in all the regions. Some certifiers collaborate more with architects and communicate with them or directly with the future homeowners, while some have developers as their main clients. There are differences in decision making and motivations between the two types of clients that will be detailed in subsection 2.4.2 Lower E-level and profile of the clients/ Motivations.

2.2 Implementation EPB/ Decision making

2.2.1 Stage design

All the interviewees that certify projects of other architects agreed that they usually make the EPB certification after the building permit was issued. They are contacted most of the time by the clients and they are asked to make the calculations to a project with a defined geometry and a roughly defined level of insulation.

"Most of the time they come to me and they say, this is our plan, the geometry is fixed and they have in mind a certain level of insulation and the thicknesses are already marked on the plans and they give an idea of installations they are willing to place." EPB certifier 1

Certifiers agree that ideally they should be contacted at an earlier stage of design, but if the project is modified during the issue of the building permit, the EPB calculations have to be done again implying additional costs for the clients.

"Yes, so my clients self, is not the architect but it's the client self when the plans are going to the government. Some architects want it to be earlier, but then you have a problem, if the government says you can't build that kind of building, then we made the study and my client cannot use it, so they have to pay two times for the EPB."
EPB certifier 6

"Normally it's when you have the building permit, but we should be contacted when they are designing the building because we always have to solve the problems when it's already too late and they can't change any..."
EPB certifier 4.

At the beginning of the implementation of the EPB regulations the certifiers were contacted even at a later stage in few occasions, when the construction was started. It has changed over the years, now they are contacted earlier and with sufficient time to make the changes to the project because architects are more aware of the importance of the EPB regulations. Yet, partly due to the building permit, the architects insist on their initial design and geometry, thus only changes at the level of systems are possible. Another option is changes in the type of glazing, rather than in the size or orientation of the windows.

"...The architects say 'That's my building, I have to have S31 with that building'... We can say you have to have screens, you have to have glass with better insulation, but not smaller windows, that's the building so that's the building, it has to be that." EPB certifier 2

When the calculations are ready, the EPB certifier usually has a meeting with the client and proposes several scenarios with different levels of ambition in terms of energy efficiency. Since the design is already decided, usually the different scenarios are based on different options of systems rather than insulation or passive measures such as compactness, size and orientation of the windows, etc.

The above does not apply in the case when EPB certifiers are also architects and they make the calculations for their own projects, as in the case of one of the interviewees. They perform EPB calculations from an early stage of design in order to make a "complete story". It is then when they decide the level of ambition in terms of energy performance, in order to incorporate passive strategies, insulation and do not limit only to systems. This design studio has a focus on sustainability, which could be another reason for this approach. The advantage of doing EPB calculations themselves allows them to do several calculations.

"That's a bit the idea of the office that's not the EPB, the EPB is not a separate thing from the architecture... We start designing and in the feasibility studies we mostly start doing the EPB because we feel if you have to change it in the end, or during the process, mostly it's more difficult." EPB certifier 7

2.2.2 Calculation method/ Software

According to the Flemish Energy Agency, the E-level depends on the following parameters: thermal insulation, airtightness, compactness, orientation, insulation, ventilation losses and systems (for heating, hot water, ventilation, cooling and lighting) (VEA 2020).

As previously mentioned, the EPB certifiers are contacted after the building permit is issued. For this reason, changes in the design that could affect compactness and orientation are not possible anymore. At the same time, further improvements in the insulation do not contribute to lower E-level. The interviewees have often

mentioned that the software is rather static and the output in terms of E-level does not respond to certain changes in the input such as thicker levels of insulation. They mention that the insulation levels are already quite high due to stricter legal requirements for S-value and U-values and after these minimum requirements are being achieved, additional insulation does not lower the E-level significantly. In the previous years, points on the E-level could be gained with better insulation than the ones required by the maximum allowed U-values.

"Sometimes you do something and the owner and the architect and me think that this will be the outcome, but you put it in the software and sometimes the software is very static and not dynamic ... not every time very logical, that's the most difficult part". EPB certifier 2

"And we feel now that U-values are... I think they are already quite strict, for walls and for... We also see if we insulate even more, that the E-value, the difference is not that big anymore, because it's already quite strict. That was different, a couple of years ago, we could gain a lot of points because the U-values were not that strict, but now buildings are so well insulated already that you don't gain many points." EPB certifier 7

On the other hand, changes in the systems results in significant changes in terms of E-level. In the subsection "Energy-efficiency measures" we will detail on the measures that are usually advised and chosen if there is a need to lower the E-level in order to achieve the EPB regulations or the levels required for a certain subsidy.

"Because we feel that what calculates really hard to the software, it's the heat pump and all this kind of stuff... I think then we go for the measures which gain the most points, that's techniques." EPB certifier 7

Most of the certifiers mentioned that the final report of the EPB calculations is not user-friendly and it is not suitable for communicating the results to the clients. Most of them have elaborated their own reports in which they present to the clients the different options with different levels of ambition in terms of energy performance.

2.3 Familiarity with the property tax reduction

2.3.1 Familiarity of the EPB certifiers, architects and clients with the property tax reduction

It is important to note that 6 out of 7 interviewees have mentioned the property tax incentive spontaneously, prior to the questions regarding this type of subsidy. It was mentioned as one of the main factors influencing the decision to aim for a certain E-level that is lower than the one required by regulations. The property tax subsidy is usually used when the certifiers communicate the results of the calculations to the clients. It is used as an argument to choose for the scenario for a lower E-level.

The EPB certifiers also agreed that overall the general public is familiar with the property tax reduction and that the share has increased comparatively with the first years of the implementation of the subsidy.

"I think like 80% of them knows it exists." EPB certifier 1

"I inform them, but now they are well informed, most of them." EPB certifier 3

Also in this regard the architect that does the EPB certifications only for the projects of his firm was an exception. He was not familiar with the details of the subsidy since his colleague was the one to provide this information to the clients. According to the architect, it is difficult for him to follow the subsidies since the requirements are always changing. In any case, since his firm focuses on sustainability, they already aim for a lower E-level in their projects than the one required by regulations.

2.4 Lower E-level

2.4.1 Lower E-level and the property tax reduction

Initially when the EPB certifiers are presented with the project of the architect, they are required to achieve the minimum E-level stipulated by the EPB regulations. Some EPB certifiers consider that this level is not easily achieved for detached houses. Yet, when EPB certifiers present the outcomes of the calculations to the future homeowners, they present several scenarios with different levels of ambition in terms of energy performance. At this stage the architects are usually not involved and the EPB certifiers are the ones to recommend different alternative measures to achieve a lower E-level in comparison with the initial project.

"Our simulations are always... in first stage just... you have to be OK, and then we do extra steps to get E20 or E30 so they can see which investments you have to do so they can see if that is interesting for them. But that's the owner who chooses, architect doesn't, mostly." EPB certifier 4

When EPB certifiers present alternative scenarios regarding how to achieve lower E-levels, they encourage their clients to invest more by using the argument of the property tax subsidy. It is important to note that six out of seven EPB certifiers mentioned the property tax reduction in this context in a spontaneous way, anticipating the questions of the interviewer in this regard.

"EPB certifier: Yes, they think about it, I always say: you think you have to pay 1000-1500 euros a year for your property tax, so, for 5 years you don't have to pay it so, 1500 per 5, you can invest that now, if you have the money, of course. So it is good for you, but, only when they are just at that point, or if they have money enough." EPB certifier 2

The property tax subsidy becomes an important argument especially in the cases when the initial project is already close to the E-level required to receive the subsidy and the extra investment needed is not too high.

"I think if you reach E28, for example, and they know that E20 is a requirement for receiving the property tax then it's easy for them to say "Make me a calculation how much does it take to win the extra 8 points" and then I make an example." EPB certifier 1

It is the case with more recent projects because the gap between the E-level required by regulation and the one to receive the property tax reduction is not as big as in the first years of the EPB implementation, see Table 1. For example, in 2020 the minimum requirement is E35 and the levels required for 50% property tax reduction is E30 and for 100% reduction E20. In comparison the gap in the initial years of the implementations was wider, in 2013 the minimum required level being E70 and the levels required for receiving the property tax reduction were of E50 for 50% and E30 for 100%. Because of a smaller gap in the recent years, opting for the E-level required to receive the property tax reduction has become more frequent.

"Most of them go for E20 or E30, because now they are demanding, since this year E35, so...E40 was already (in the last year 2019), the difference was not that big anymore, so, it was when they demanded E50 that was bigger the gap. But now, they say let's go all the way, we have to do it anyway. Now it's almost a standard". EPB certifier 4

The interviewee who is also the architect of his certifications encourages his clients to opt for even more ambitious targets, such as E10, while E30 was the minimum standard for their projects since two years. Yet, it is

important to notice that this studio is specialised in sustainability, therefore the profile of clients could be more environmentally conscious.

2.4.2 Lower E-level and profile of the clients/ Motivations

The property tax incentive is the only financial incentive presently available for homeowners who opt for a lower E-level than the one required by regulations. It appears to be a rather strong motivation to invest more initially because the exemption over 5 years of the property tax implies important monetary savings. The main issue is that according to the interviewees, mostly clients from the higher income group decide to invest more in order to benefit from the property tax reduction. It cannot be determined whether this category would have chosen the same lower E-levels in the absence of the property tax incentive, yet interviewees mentioned several other motivations. These include better quality of the house and being futureproof. This is especially the case for properties that are built by developers or private owners as an investment and are intended to be sold.

"But mostly, the budget is the primary reason why people make certain choices. So they come here and they ask me "Is it possible to get my EPB with as less investments? Can I do it with gas heating, with a simple gas (boiler)?" Yea, that's possible, if you design simple houses, you can do that perfectly. With gas heating and solar panels... and an airtightness test, then it will be OK. But that's not the people who are going to get E20, that's the part that I find unfair, it's always the richest people who can do the most investments, who get the most benefits."
EPB certifier 4

For other homeowners, the investment appears to be already high for achieving the minimum required E-level and they often refuse any additional investments due to financial restraints. Certifiers have mentioned that in the recent years the construction cost for the same type of dwellings with similar levels of energy efficiency has risen. One of the EPB certifiers fears that the property tax incentive could be capitalised in the cost of the construction.

"Well, that may be also something we feel that if there are... if government invests in tax reduction and everything, we have the idea that the prices go up. So I think in a way the money that it gets cheaper to build, we have the idea the prices get more expensive." EPB certifier 7

One of the certifiers mentioned that some clients are concerned that a lower E-level would imply a higher property tax after the 5 years of exemption. He specified that neither him nor the clients are familiar with the methodology of calculating the base of the property tax, this being a supposition. Yet, these clients do not opt for the E-level required to achieve the property tax subsidy and opt for the minimum EPB standard.

At the same time, some interviewees mentioned that they have noticed a trend of more awareness regarding energy efficiency in the last years. People that partly build the dwelling themselves are more interested in the EPB and are more in contact personally with the EPB certifier. Some clients are informed from fairs regarding certain technologies and insist on opting for them. At the same time, if they are against a certain system, for example mechanically-balanced ventilation, they are willing even to pay the fine as long as they can avoid installing it. Some assume that ventilation could affect the indoor comfort and convenience of a natural ventilation. Likewise, some clients are against certain insulation materials for environmental or health reasons. More details regarding technologies will be presented in the following subsection 2.5 Energy-efficiency measures.

2.4.3 Lower E-level and other policies

One of the research questions of the study was whether other policies played a role in the bunching effect illustrated in Figure 1 besides the property tax incentive. One of the hypotheses was the '*anticipation effect*' of the minimum requirements of the following years, since the Flemish Energy Agency has been announcing a calendar for the following years. For example, the minimum requirement of E40 in 2018 coincides with the level required for a 50% property tax reduction in 2015, see Table 1.

From the answers of the interviewed EPB certifiers can be deduced that there are two categories of clients. The first category has a limited budget and asks the EPB certifier to achieve only the minimum required level for that year. The second category is wealthier and chooses for higher energy efficiency than required mainly to be able to benefit from the property tax reduction. Yet, the interviewees mentioned other motivations for the higher income homeowners that opt for their house to be futureproof, i.e. "*a comfortable, high quality house and also which can last for a long time*" and "*that is built for the future*". It is mainly the case if the new construction is seen as an investment and not the first residence. Yet, none of the EPB certifiers linked this concept of futureproof with the evolution of the legal requirements. The general trend of tightening of E-levels could have played a psychological effect, but the presence of the '*anticipation effect*' is unclear even in the higher income group of clients.

In the previous years, other financial incentives were available for achieving higher standards of energy performance, for example income tax incentives and cash incentives offered by the grid operators. The former was not mentioned by the interviewees perhaps because it was in place only until 2013. The latter was mentioned as not being available anymore too. Only one certifier mentioned a financial incentive that is still available, that is a more convenient loan from the bank.

2.5 Energy-efficiency measures

All the interviewed EPB certifiers present to their clients a final report with alternative scenarios after they compute the simulations using the EPB software. One of the options, mainly based on the initial design, aims to achieve the minimum required level, while the other scenarios are more ambitious. Therefore, if the homeowners need to improve the initial design to achieve the legal standard or if they opt for the E-levels required for the property tax reduction, they follow the advice of the EPB certifier. Usually at this stage the architect is not involved anymore.

"I always calculate how, what do to reach standard, doing nothing special, how is the house as it is, with the standard technique like gas heating, the ventilation D. And then from that point I start simulating what happens when you take PV panels, if you put thermal panels and so on and then, so they then have a quite good view of what they can reach... but OK, it will cost." EPB certifier 3

As previously mentioned, the EPB certifiers are contacted after the building permit was issued. For this reason, modifications to the design of the dwelling are not possible anymore, thus the EPB certifiers can only propose changes to the building shell and to the systems. The minimum required levels for S-level regarding the building shell are already quite strict, hence improving the insulation does not contribute significantly to lowering the E-level. As a result, EPB certifiers usually recommend improvements in terms of systems. According to the interviewees, some measures are advised and chosen more often, such as PV panels, ventilation system and heat pumps, see

Main thematic codes	Secondary thematic codes	Files (number of certifiers)	References (number of citations)
---------------------	--------------------------	------------------------------	----------------------------------

Profile EPB certifier	Profile EPB certifier	7	7
	Type of clients	7	8
	Number of certifications	7	7
	Regions	7	7
Implementation EPB/ decision making	Implementation EPB	2	4
	Stage design	7	16
	Calculation method/ Software	5	9
Familiarity with property tax incentive	Familiarity architects	3	6
	Familiarity EPB certifier	3	3
	Familiarity clients	5	8
Lower E-level	Lower E-level	4	11
	Lower E-level and property tax incentive	7	22
	Lower E-level profile clients	5	7
	Lower E-level motivations	4	7
	Lower E-level and other policies	3	5
EE measures	EE measures	4	6
	PV panels	7	18
	Ventilation	5	9
	Heat pumps	5	8
	Insulation	4	7
	Airtightness test	3	6
	Solar water heaters	2	2
	Windows	2	2
nZEB	nZEB	1	1
	nZEB profile clients	7	11
	nZEB motivation	5	6
	nZEB other policies	5	6

. The airtightness test is also an effective way to achieve a lower E-level, as it allows to include the actual airtightness level in the EPB calculation. The airtightness test is optional, yet in the case it is not done a penalising default value for the airtightness level is applied in the EPB calculation.

"We make a pre-calculation and we give always some advice to how they can go to the E-peil (E-level), and mostly for the E-peil it is possible with the PV panels, or the airtightness, or with heat pumps, instead of the construction themselves. Construction is more of a problem for the S-peil (S-level), today it is kind of difficult, when we have an S-peil of 28 next year it will be more difficult, only from the kind of building." EPB certifier 6

The architectural firm that certify their own projects is an exception to the above approach. They are able to make EPB simulations at an earlier design stage and they try to convince the clients to invest in the building shell before investing in systems. Being a firm specialised in sustainability, their clients usually aim for lower E-levels than required from the beginning.

"We really try to convince our clients to first put the money in the insulation, in airtightness of the building and then in the techniques. We always find it strange if we, yea, if you do the other way around."

When EPB certifiers present clients different alternatives for systems or insulation, often clients have preferences or they are categorically against certain systems or types of insulation. If they have a negative attitude towards a certain measure, such as heat pump or ventilation, the EPB certifiers find it difficult to convince them even if those systems score well in the calculation software and are fit for the project. Some interviewees mentioned that construction fairs such as Batibouw, an annual construction fair in Belgium is a place where homeowners get informed, others mentioned discussions with architects or other informal sources of information.

"Mostly, I think 8 out of 10 times they already know what they want. So, if they want a heat pump, they already know they want a heat pump, before we are there, if they don't want the heat pump, they know they don't want the heat pump, it's a bit, I think they search themselves on the internet, architects say some things and they go on with that." EPB certifier 2

2.5.1 PV panels

Amongst the interviewed EPB certifiers there was consensus that increasing the capacity of the PV system is the most commonly used method to lower the E-level, either in order to reach the legal standard or the level required for the property tax incentive. It is also the most frequently mentioned energy efficiency measure with 18 references by all the interviewees, see

Main thematic codes	Secondary thematic codes	Files (number of certifiers)	References (number of citations)
Profile EPB certifier	Profile EPB certifier	7	7
	Type of clients	7	8
	Number of certifications	7	7
	Regions	7	7
Implementation EPB/ decision making	Implementation EPB	2	4
	Stage design	7	16
	Calculation method/ Software	5	9
Familiarity with property tax incentive	Familiarity architects	3	6
	Familiarity EPB certifier	3	3
	Familiarity clients	5	8
Lower E-level	Lower E-level	4	11
	Lower E-level and property tax incentive	7	22
	Lower E-level profile clients	5	7
	Lower E-level motivations	4	7
	Lower E-level and other policies	3	5
EE measures	EE measures	4	6
	PV panels	7	18
	Ventilation	5	9
	Heat pumps	5	8
	Insulation	4	7
	Airtightness test	3	6
	Solar water heaters	2	2
	Windows	2	2
nZEB	nZEB	1	1

	nZEB profile clients	7	11
	nZEB motivation	5	6
	nZEB other policies	5	6

. It is chosen by EPB certifiers and clients for various reasons. Firstly, in the calculation method the PV systems lower the E-level significantly. Secondly, it is easy to simulate various scenarios by adding extra m² of PV panels especially when the difference between the targeted E-level and the existing is small. Besides, it is easy to compute the cost of the investment cost and compare it with the property tax reduction. Some EPB certifiers compared the cost of a property tax for an average house with the cost of PV system, yet is it unclear whether all the aspects of the payback calculations for a concrete project are considered in detail.

"If you have some extra money it is better to do now because it is an investment and keeping the money at the bank it is 0% if for example you put solar panels you have a moderate gain even when you have to pay the distribution tax, even... It is still a good investment, and that's what I try to tell them... Then you have already part of this money and that's what I try to explain, 5 years no tax that means around, for a moderate house around 5000 euros, how much is the cost for like 20 PV panels? 7000 euros, so you have already a big amount, but OK, in 5 years." EPB certifier 3

Some certifiers mentioned that PV systems are relatively less expensive compared to other systems, such as more energy-efficient ventilation systems or heat pumps.

"Interviewer: Are there any measures that come up more often?"

EPB certifier 3: Most of the time the PV panels is the most because it's the least expensive and it brings the most points in E-level, so that's best thing to do, but besides that heat pump, also and solar panels... thermal."

At the same time, EPB certifiers stressed out that clients are concerned with the changing legal framework and existing taxes and financial incentives. They would prefer a predictable framework where they can estimate the future benefits and expenses. For example, EPB certifiers are careful in recommending to increase excessively the capacity of the PV system because it would borne additional expenses for using the grid.

"So we stay within certain boundaries, we're not going to say they need 10kW when it's only 5, because it will cost them 500 euros extra per year and they don't need the electricity. So you have to search a balance between all the techniques. But that's always simulating." EPB certifier 4

2.5.2 Ventilation system

Even though less often than PV panels, a better performing ventilation system is also recommended by EPB certifiers, some considering it as the easiest option to lower the E-level:

Interviewer: "Which are these measures most of the time? Are there certain measures that you advise more, that are more used?"

EPB certifier 1: "I would say ventilation number one because the range in ventilation systems is very wide. With a simple ventilation system you don't get many points of reduction but you can easily win 10 to 20 points with the ventilation. "

Recently the calculation method has changed in order to incorporate more refined options, for example demand controlled ventilation systems. As previously mentioned, these more efficient systems can lower significantly the E-level, yet they are more expensive. Moreover, if with the PV systems small incremental changes are possible, opting for a more efficient ventilation system means a significant additional investment.

Homeowners have polarised opinions regarding ventilation systems. Especially in the first years of the EPB implementation, some clients would insist against installing ventilation system D with mechanical supply and extraction. These clients would ask the EPB certifier to calculate the cost of the penalty for not achieving the required E-level, considering the avoided cost of the ventilation system. The clients used the argument of the convenience in use of natural ventilation.

"Yes, a penalty and not put ventilation, because they say "I open the window when I sleep", but I say, it just means to not open your window and have calculated ventilation, so you're not losing a lot of heat. They don't understand, so to people, that are building, you cannot explain that... In the past the houses were open, old walls, openings around the door, so the ventilation system was in place, but it was natural, it was by nature. But now we close our houses with insulation..." EPB certifier 3

Some homeowners are not aware that for the current standards of nZEB, balanced ventilation with heat recovery is required for achieving the required low E-levels and indoor air quality. Even some architects, especially at an earlier stage of the EPB implementation see the ventilation system as a requirement to comply with for achieving the EPB certificate, rather than as a mean to achieve indoor healthy environment. Often there is a contradiction between the professional advice of the architects and the one of the EPB certifiers and some interviewees feel that the clients tend to trust the architects more.

"At the beginning of the EPB there was a lot of mould, some architects were against the ventilation, but more insulation you have, you place, the more airtight the building is, more important is the ventilation. Now more architects understand the concept, but all the architects say the ventilation is not necessary, only for the EPB... Indeed there is a lot of misinformation and the clients, they believe the architect above us. And some discussion we have, we say, it has to be, it is a law you have to follow. Also for the health of the building, for your own health, it is necessary to do it." EPB certifier 6

2.5.3 Heat pumps

Alongside PV panels and ventilation systems, EPB certifiers mentioned heat pumps as an effective measure to achieve lower scores of E-level, see Table 3. For example it is possible by opting for a geothermal heat pump instead of air to water heat pump:

"Mostly they have everything but they will increase everything a little bit more or they install things that perform a little bit better than normal. For example a heat pump, you have air to water heat pump, they can think of ground to water heat pump, some things they will change a little bit, to have better results." EPB certifier 2

According to interviewees, they recommend heat pumps more often since 2018, which can be related with a change in the calculation method that allows differentiating better between different heat pumps or different ventilation systems.

EPB certifiers find difficult to change some preconceptions of their clients in favour or against heat pumps and construction fairs such as Batibouw often play a role in the choice of homeowners:

"We see ups and downs in the heat pumps, there are periods when heat pumps are popular and I think it's mostly after Batibouw, events where they can, yea, they can influence people." EPB certifier 4

2.5.4 Airtightness test

The airtightness test is optional, yet, in its absence a penalising default value of 12 m³/h.m² is assigned in the EPB calculations, whereas on average the actual airtightness value is only 3,6 m³/h.m² (VEA 2019). Most of the certifiers advice it strongly to their clients in order to achieve a lower E-level of approximately 10-15 points. It is a very cost-effective measure and it is often mentioned as part of a minimum 'package' for those homeowners who want to achieve the legal standards with a minimum investment. For other clients, who consider opting for lower E-levels, the property tax subsidy is an important incentive to undertake the airtightness test.

2.5.1 Solar water heaters/ Insulation / Windows

In comparison with other systems such as PV panels, heat pumps and insulation, solar water heaters were mentioned very seldom. It appears to be less recommended and chosen by the homeowners in the cases that they opt to lower the E-level of the dwelling.

Building shell theoretically contributes to the calculation of the E-level (VEA 2020). Yet, since the minimum required S-level and U-values are so strict, in the last years adding more insulation does not change significantly the E-level. It was not the case in the first years of the EPB implementation.

"The thing is that the insulation and the windows just to get the S-peil (S-level) on S31, and then they have to invest to have a good E-peil, but the insulation is already so good, so extra insulation, it will not change the E-peil (E-level)." EPB certifier 2

As previously mentioned, the architects with a focus on sustainability have a different approach. The EPB certifier who is also the architect of the project tries to convince his clients to invest first in the building shell and only afterwards in systems:

"But we start with, we start by insulating, then by building airtight, that's the first two options for us, the first two logical steps, and then we go to the techniques, because those cost lots of money and they get broken in time." EPB certifier 7

Other certifiers also mentioned their regret that the insulation does not weight more in the calculation method, since insulation would last more than the systems and it is less likely to be replaced in time.

Regarding windows, often it is a source of conflict between architects, EPB certifiers and clients. Architects insist on their initial design in terms of size and orientation of the windows, moreover that the building license was issued. Therefore, in order to achieve the required S-level the alternative to reducing the size of the windows is to opt for more expensive energy-efficient windows. In some cases, architects advise their clients to opt for paying the penalty rather than making changes to the design or investing more in better performing windows.

"With a design that is not so compact. I have to say the only thing you can do it triple glass. That is a lot more expensive, if you have a lot of glass, they won't change their concept. Sometimes architects say to their clients "You have to pay penalty if the S-peil (S-level) is too high". Some architects say it is cheaper to pay the penalty as to change the concept of the building, or to invest in more insulation, or more triple glass." EPB certifier 6

2.6 nZEB

2.6.1 nZEB profile clients/ motivations/ nZEB other policies

Starting from next year on the nZEB level of E30 will become the minimum requirement for new constructions. In the year when the interviews took place it was E35, yet in the first years of the EPB implementation the gap between nZEB and the legal standards was wider, see Table 1. The EPB certifiers were asked which type of clients were opting for the nZEB standards in the previous years and who targets more than nZEB nowadays.

There is consensus among interviewees that these are usually clients with higher income, who sometimes invest in a second property with the aim to invest or even resell. These are seldom private homeowners but rather developers or constructors investing in apartment buildings. Their main aim for investing in higher standards of energy performance is building quality and to have a futureproof property that can be advertised for resale.

"I think the main purpose for choosing for the BEN building was, if we build now, we reach E50 for example, how much will our building be worth in say, 10 years? So I think it would be smarter to make a BEN building now then ..." EPB certifier 1

Most of the private homeowners building the first residence as a single-family house are usually interested to achieve the minimum required E-level. Only recently, when this level is close to the one required by the property tax, they are motivated to invest more to achieve it. Also few architects were interested to promote the nZEB, only the ones who have sustainability as a promotional label.

"If they build now a house for the resale, they can say "If you buy my house, you are ready for the future, because I have the E-level of 20". For the architect it doesn't matter, only for the architects who want to communicate to their clients "I am the best architect to get for the BEN (nZEN) building" but most of the architects they have clients that are very different, and they say "Yea, leave it to the client, if they want to get the BEN (nZEB), you have to communicate with the EPB man, the ones who want to get it". But it's not always the architect who says "You have to do that to get there"." EPB certifier 6

According to the EPB certifiers, when the gap between the E-level required by the regulations and one required by the property tax incentive was very wide, the best policy for promoting nZEB was the tightening of the minimum requirements. They are sceptic that other policies can promote buildings with higher standards than nZEB. According to them, few clients build passive houses now because they require significant additional investment, and subsidies are usually not a motivation for that type of clients.

3. CONCLUSIONS AND POLICY RECOMMENDATIONS

The primary purpose of the study was to determine whether the property tax incentive offered to achieve higher levels of energy performance for new constructions was effective in encouraging additional investments in energy efficiency in the residential sector in Flanders. Data shows that homeowners make an effort to invest more in energy efficiency to achieve levels required by the property tax reduction. The purpose of the interviews with EPB certifiers was to understand homeowners' decision-making process relative to energy efficiency investments and determine if the property tax reduction plays a role in it. The bunching effect could have been

alternatively explained by an 'anticipation effect' of the minimum required levels of the following years or by other financial incentives such as income tax reduction or cash incentives offered by grid operators.

Based on the interviews with EPB certifiers, we can conclude that the property tax incentive appears to be an effective method to encourage homeowners to invest more in energy efficiency than required by legal standards. Nevertheless, the incentive is more effective in recent years when the gap between the property tax reduction levels and the legal standards is lower. For example, in 2020, when the interviews took place, the legal requirement is E35 and the level to achieve a 50% reduction of the property tax is E30, while for a 100% reduction, the level is E20. In the following years, the property tax incentives can be used to continue to encourage lower E-levels for renovations. At the same time, EPB certifiers mentioned that achieving low E-levels for renovations is not always feasible due to various constraints, and the extra investment needed could be higher.

EPB certifiers agreed that when buildings standards were lower in the previous years, mostly higher-income clients were opting for nZEB. Today it is the case for dwellings with higher standards than the minimum required nZEB. This type of clients usually invests in a second dwelling; it is an investment rather than the first residence. Their motivations are mainly for the property to be of high quality and futureproof, in the view of a possible resale. As it often happens, there is the risk that higher income groups benefit more from financial incentives (Heylen 2016, Verbeeck 2016). Another risk mentioned is that the property tax incentive could be capitalised in the price of construction. According to the EPB certifiers, the best policy to encourage nZEB was the legal standards. Therefore, the property tax incentive may not be effective in encouraging significant investments in energy efficiency, but it is very effective to accompany the tightening of the minimum requirements and encourage small incremental improvements of E-level. Therefore, in the future, it could still be effective for encouraging more ambitious renovations if the levels required for the property tax reduction would be close to the minimum requirements. A limitation of the study is that the cost-effectiveness of the policy is not evaluated, especially in comparison with other policies.

EPB certifiers are usually contacted after the building permit has been issued to avoid redoing the calculations if there are changes in the project. For this reason, the building design is fixed, and if the required E-level is not met, EPB certifiers have margins to intervene only in terms of HVAC and PV systems or building shell. Once the minimum required S-level is reached for the building shell, an additional increase in insulation does not significantly lower the E-level.

All the EPB certifiers present their calculations to the clients in various scenarios: one to reach the minimum requirements and other more ambitious scenarios in terms of energy efficiency. 6 out of 7 interviewees mentioned the property tax incentive spontaneously as an important argument to encourage investments in lower E-levels. Usually, the energy efficiency measures are recommended by the EPB certifier directly to the client, without involving the architect. The most frequently used method is to increase the capacity of the PV system. According to the EPB certifiers, it is cost-effective and allows to simulate and adjust the capacity as much as needed to achieve the targeted E-level. Another cost-effective measure is the airtightness test. The test is voluntary, yet the default value given in case of not doing it is very penalising while doing it can lower the E-value even with 10-15 points. Other frequently used measures are efficient ventilation systems and heat pumps. It can also contribute considerably to lowering the E-value, yet the investment cost is relatively high.

Nevertheless, applying systems to a predefined design means losing many opportunities. One of the EPB certifiers interviewed is an architect of a design firm focused on sustainability. If the rest of the interviewees

certify other architects' projects, this practice certifies only their own projects. It allows them to start simulating from an early design stage and to repeat the calculations various times. Their principle is a holistic approach, to start with the design, then they try to convince clients to invest in the building shell and only at the end to add systems. They aim for lower E-levels than the minimum requirements as a standard procedure. This type of EPB certifiers, also the architects of the projects, is more likely to certify a few projects per year. According to the Flemish Energy Agency, the number of EPB certifiers who realise less than five projects per year is diminishing in recent years. This profile of EPB certifiers is responsible for only 2% of the total certificates released in 2018 (VEA 2019). At the same time, the other type of certifiers, who are specialised in EPB certifications and make the calculation for the projects of other architects, are responsible for the majority of certifications. 12% of the active EPB certifiers made 69% of the total certifications in 2018 (VEA 2019). The interviewed certifiers also believe that fewer architects continue to have an EPB certification and leave the aspects regarding energy performance to the EPB certifiers. The Flemish Energy Agency could involve more architects in the EPB implementation and should enable and encourage the certification at an earlier design stage. If the aim will be to promote higher energy performance standards than the minimum required nZEB level, these are achievable only by applying a holistic approach at an early design stage.

REFERENCES

- EC (2002). Directive 2002/91/EC on the energy performance of the buildings The European Parliament and the Council of the European Union. Official Journal of the European Communities.
- EC (2010). Directive 2010/31/EU on the energy performance of buildings (recast). The European Parliament and the Council of the European Union. Official Journal of the European Union.
- EC (2018). Directive (EU) 2018/844 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. The European Parliament and the Council of the European Union. Official Journal of the European Union.
- Heylen, K. (2016). Woonsubsidies in Vlaanderen. Verdelingsanalyse voor 2013 Leuven, Steunpunt Wonen 88.
- VEA (2019). EPB-cijferrapport. Procedures, resultaten en energetische karakteristieken van het Vlaamse gebouwenbestand – periode 2006-2018. , VEA Vlaams Energieagentschap.
- VEA (2019). EPB - Cijfers en statistiek voor EPB-aangiften ingediend tot en met 31/12/2018, VEA Vlaams Energieagentschap: 27.
- VEA. (2020). "E-peil." Retrieved April 2020, 2020, from <https://www.energiesparen.be/EPB-pedia/E-peil>.
- Verbeeck, G. (2016). Financiële steun voor investeringen in energie. Verdelingsanalyse van REG-premies en belastingvoordelen. Leuven, Steunpunt Wonen: 101.

ATTACHMENT 1

List of questions used as a guideline for semi-structured interviews with EPB certifiers

Thank you for your availability for this interview. First of all I would like to point out that all the questions will regard EPB certificates of residential, single-family dwellings and they will not regard multi-family apartment buildings.

At which stage of the design process are you contacted for the EPB certificate?

Do you usually communicate with the architect, with the homeowners or with both?

Do the homeowners or architects sometimes communicate with you about a certain E-level they target?

Which factors influence this decision according to you?

If the legal E-level or a specific targeted E-level is not achieved with the design of the architect, who is proposing extra measures? (You? the architect? The homeowner?)

Are there certain measures that are used more often than others to reach a certain E-level if the design doesn't meet the pre-set requirement? (If necessary, e.g. thicker insulation, more energy efficient windows, PV panels, changes in the heating system, ventilation system?)

According to you, what type of profile of homeowner is the one that usually chooses to build at higher standards than requested by the building regulations in terms of energy performance?

What are usually their motivations?

Do financial incentives offered by the administrations influence their decisions? (If necessary, e.g. property tax reduction property tax incentive, income tax reduction and REG premies (until 2017))

Are you familiar with the property tax reduction offered in Flanders for achieving a certain E level for the new constructions and renovations?

If necessary Starting from 2009 in Flanders property tax reductions are offered for new constructions and renovations for achieving certain levels of energy performance (E-levels). For example in 2019 for achieving an E level of E30 homeowners would benefit from a 50% reduction of the PT rate and for E20 the reduction is of 100%. The minimum requirements for new constructions for 2019 is E40.

According to you, are homeowners and architects familiar with the property tax reduction offered in Flanders since 2009 for achieving a certain E-level?

If not, do you inform them about it?

What can you say about the impact of the property tax reduction?

Is there another incentive or another policy measure that could work better than the existing ones?

In your opinion, which of the existing policies was the most effective to encourage the construction of nZEBs in the last years?

How long have you been an EPB certifier?

The minimum requirements and the incentives offered have changed over the years, how did the homeowners adapted to them? Have you noticed any change in how decisions regarding the energy efficiency of the dwellings are made over the last years?

How many certificates do you usually do per year?

Do you work only in Flanders or also in Brussels and in the Walloon Region?

Are there any differences between the Regions?

ATTACHMENT 2

Quantitative analysis

GLMSELECT procedure using SAS software with E-level as the dependent variable.

Step	Effect Entered	Number Effects In	Number Parms In	Adjusted R-Square	ASE	Validation ASE	Test ASE
0	Intercept	1	1	0.0000	428.9499	428.0396	424.9011
1	Primary energy from PV	2	2	0.5020	213.5989	213.7629	214.0931
2	Airtightness test	3	3	0.7071	125.6347	127.2184	126.2046
3	U-value	4	4	0.7899	90.1211	92.0458	90.4795
4	Heat pump	5	5	0.8186	77.8018	80.0546	78.5160
5	Compactness	6	6	0.8433	67.2129	69.0593	67.2847
6	Ventilation system	7	10	0.8551	62.1332	64.0017	62.5316
7	ENERGIEDRAGERkl	8	13	0.8665	57.2648	58.7782	57.2977
8	Surface windows	9	14	0.8701	55.7031	57.3858	55.5208
9	HEB_TYPE_SYSTEEMkl	10	18	0.8719*	54.9181	56.5671*	54.6826

* Optimal Value of Criterion

Stepwise Selection Summary

Step	Effect Entered	F Value	Pr > F
0	Intercept	0.00	1.0000
1	Primary energy from PV	50426.3	<.0001
2	Airtightness test	35018.4	<.0001
3	U-value	19708.8	<.0001
4	Heat pump	7919.16	<.0001
5	Compactness	7879.05	<.0001
6	Ventilation system	1022.09	<.0001
7	ENERGIEDRAGERkl	1417.07	<.0001
8	Surface windows	1402.00	<.0001
9	HEB_TYPE_SYSTEEMkl	178.67	<.0001